

LAB 5

SUBJECT :MATHEMATICS FOR EMBEDDED SYSTEMS

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PROGRAM:

a.

```
#include <limits>
#include <iostream>
#include <cmath>
using namespace std;

long double factorial(long double a)
{
    if(a > 1)
        return a * factorial(a - 1);
    else
        return 1;
}

long double derivative(long double k)
{
    long double x = 0, deg = 3.141592654/180, l=0,m=0,o=0,temp,y=0;

    y = x*(3.141592654/180);
    for (int i=0;i<k;i++)
    {
        temp = sin(y);
        y = sin(y+(3.141592654/180));
        cout << temp << "\n";
        y = y - temp;
        cout << y<< "\n";
        y = y/deg;
        cout << y<< "\n";
        cout << i << "\n"<< y << "\n";
        temp = asin(y);
        y = temp;
    }
    return x;
}

long double power(long double k, long double p)
{
    long double x = k;
    if(p==0)
        return 1;
    else
    {
        for(int i=1;i<p;i++)
        {
            x = x*k;
        }
        return x;
    }
}
```

```

int main()
{
    long double n, m = 0, a;

    cout << "Enter a positive integer: ";
    cin >> n;
    cout << "Enter a positive integer: ";
    cin >> a;
    n = (n*3.141592654)/180;
    cout << "Factorial of " << a << " = " << factorial(a)<<"\n";
    for(long double j=0;j<=a;j++)
    {
        cout << "power of " << j << " = " << power(n,j)<<"\n";

        m = m + (derivative(j)*(power(n,j)))/factorial(j);
        cout << "mac " << m;
    }

    return 0;
}

```

Output:

The screenshot shows the Eclipse IDE interface. The main editor window displays the source code for `Diff.cpp`. The code includes a `main` function that prompts the user for two positive integers, `n` and `a`. It then calculates the factorial of `a` and the power of `n` for each integer `j` from 0 to `a`. The output is displayed in the console window.

The console output shows the following results:

```

<terminated> (exit value: 0) Diff [C/C++ Application] /home/stebin/eclip
0.00460322
0.00460322
0.0174515
0.999898
8
0.999898
0.999898
9.64029e-05
0.00552348
9
0.00552348
mac 0power of 11 = 0.0701437
0
0.0174524
0.999949
0
0.999949
0.999949
2.35613e-05
0.00134997
1
0.00134997
0.00134997
0.0174522
0.999937
2
0.999937
0.999937
4.43189e-05
0.00253928
3

```

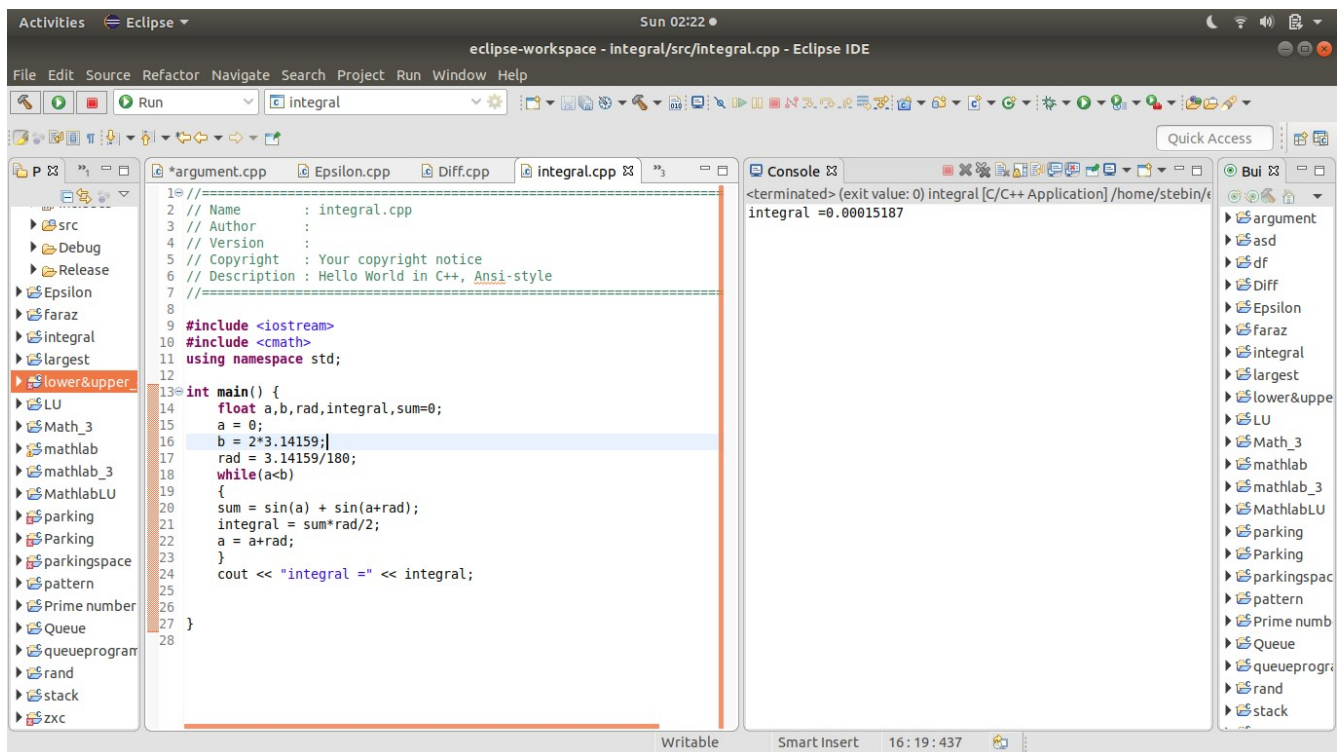
b. Integral

```
#include <iostream>
#include <cmath>
using namespace std;

int main() {
    float a,b,rad,integral,sum=0;
    a = 0;
    b = 2*3.14159;
    rad = 3.14159/180;
    while(a<b)
    {
        sum = sin(a) + sin(a+rad);
        integral = sum*rad/2;
        a = a+rad;
    }
    cout << "integral =" << integral;

}
```

Output:



The screenshot displays the Eclipse IDE interface. The main editor window shows the source code for 'integral.cpp', which includes headers for `<iostream>` and `<cmath>`, uses the `std` namespace, and implements a `main` function. The function calculates the integral of $\sin(x)$ from $a=0$ to $b=2\pi$ using a Riemann sum approximation with a step size of $\pi/180$. The output of the program is displayed in the 'Console' window on the right, showing the message: `<terminated> (exit value: 0) integral [C/C++ Application] /home/stebin/... integral =0.00015187`. The left sidebar shows a project explorer with various folders and files, including 'src', 'Debug', 'Release', 'Epsilon', 'faraz', 'integral', 'largest', 'lower&upper', 'LU', 'Math_3', 'mathlab', 'mathlab_3', 'MathlabLU', 'parking', 'Parking', 'parkingspace', 'pattern', 'Prime number', 'Queue', 'queueprogram', 'rand', 'stack', and 'zxc'.